

REMARKS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 1, 3-7, 10, 11, 13-17, 20, 21, 23-27, and 30 are currently pending. Claims 1, 3-5, 11, 13-15, 21, and 23-25 have been amended by the present amendment. The changes to the claims are supported by the originally filed specification and do not add new matter.

In the outstanding Office Action, Claims 1, 3, 4, 6, 7, 10, 11, 13, 14, 16, 17, 20, 21, 23, 24, 26, 27, and 30 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 6,282,305 to Huo et al. (hereinafter “the ‘305 patent”);¹ and Claims 5, 8, 9, 15, 18, 19, 25, 28, and 29 were rejected under 35 U.S.C. § 103(a) as being unpatentable over the ‘305 patent in view of the Caldwell et al. reference (“Physical Biology, Volume 35, No. 2, pages 235-247”).

Amended Claim 1 is directed to a method for a computerized analysis of a mammogram in digital form of a breast of a patient, comprising: (1) extracting from the mammogram plural fractal-based features at multiple scales associated with a texture of a parenchyma of the breast; (2) applying the plural fractal-based features to at least one of a linear discriminant classifier and an artificial neural network classifier; and (3) generating a risk marker indicative of a breast disease risk for said patient based on an output of at least one of a linear discriminant classifier and an artificial neural network classifier. The changes to Claim 1 is supported by the originally filed specification and do not add new matter.²

In a non-limiting example, Applicants refer the Examiner to Figure 4, which shows a graph of the log of surface area to a log of pixel size, which is calculated for various pixel

¹ Applicants note that Claims 10, 16, and 20 were not listed on page 2 of the outstanding Office Action as being rejected on these grounds, but that Claim 16 is mentioned on page 7 and Claim 10 is mentioned on page 5. Accordingly, Applicants believe that the Examiner intended to list Claims 10, 16, and 20 in the rejection under 35 U.S.C. § 102 on page 2.

² See Figures 4 and 5 and the discussion related thereto in the specification.

sizes ϵ . The slope of a line through the points in this graph is indicative of the fractal dimension. However, in one embodiment, the points in the graph are applied directly to a linear discriminant analyzer, which outputs a radiographic marker that is similar to the fractal dimension. See, e.g., paragraph [0049] in the originally filed specification.

The '305 patent is directed to a method for the computerized assessment of breast cancer risk, including the steps of obtaining a digital image of a breast of a person, determining values of parenchyma features of a breast region at a predetermined parenchymal location in the digital image, which includes determining the value of a skewness feature based on gray-level as to RAM analysis of pixels within the predetermined parenchymal location. Further, the '305 patent discloses that values of coarseness and contrast features, as well as a balance feature and a first moment of the power spectrum feature may be determined. Further, the '305 patent discloses that the method for computerized assessment of breast cancer risk includes the step of comparing the values of the determined features with a predetermined model associating values of the features with a respective risk estimate, and outputting a result of the comparing step as a risk classification index indicating likelihood of future onset of breast cancer.

However, Applicants respectfully submit that the '305 patent fails to disclose the step of extracting from a mammogram plural fractal-based features at multiple scales associated with a texture of the parenchyma of the breast, as required by Claim 1. In this regard, Applicants note that the passages cited by the outstanding Office Action regarding the extracting step, in column 9 and column 10 of the '305 patent, do not mention fractal-based features. The '305 patent only mentions fractal dimension in passing with respect to various prior art studies.³

³ See, e.g., '305 patent, column 11, lines 33-36.

Further, the '305 patent fails to disclose extracting from a mammogram plural fractal-based features at multiple scales and applying the plural fractal-based features to at least one of a linear discriminant classifier and an artificial neural network classifier, as required by Claim 1. While the '305 patent discloses linear discriminant analysis, it does not disclose applying plural fractal-based features at multiple scales to a linear discriminant classifier and an artificial neural network, as required by Claim 1. In this regard, Applicants note that computing a fractal dimension, is not equivalent to applying plural fractal-based features to at least one of a linear discriminant classifier and an artificial neural discriminant classifier, as recited in Claim 1. As shown in the non-limiting example of Figure 4, a fractal dimension can be computed by determining the slope of the points of a line through the points in the graph of the log of the surface area to the log of the pixel size. However, Applicants note that Claim 1 requires applying plural fractal-based features at multiple scales to a linear classifier or a neural network.

For the reasons stated above, Applicants respectfully submit that the rejection of Claim 1 is rendered moot by the present amendment to Claim 1.

Independent Claim 11 is directed to a system that includes a feature extraction mechanism that extracts from the mammogram plural fractal-based features at multiple scales associated with a texture of a parenchyma of the breast, and a classifier mechanism to which the plural fractal-based features are applied. Similarly, Claim 21 is directed to a computer readable medium storing instructions for execution on a computer system, which includes the steps of extracting from the mammogram plural fractal-based features and applying the plural fractal-based features to a linear discriminant classifier or artificial neural network. As discussed above, the '305 patent fails to disclose these limitations. Accordingly, Applicants respectfully submit that amended Claims 11 and 21 (and all associated dependent claims) patentably define over the '305 patent.

Regarding the rejection of dependent Claims 5, 15, and 25 under 35 U.S.C. § 103, Applicants respectfully submit that the Caldwell et al. reference fails to remedy the deficiencies of the '305 patent, as discussed above. Although the Caldwell et al. reference discloses determining a fractal dimension, the Caldwell et al. reference does not disclose applying plural fractal-based features to at least one of a linear discriminant classifier and an artificial neural classifier, as required by Claim 1.

Dependent Claim 3 has been amended to clarify that the extracted step comprises extracting surface areas or volumes at multiple pixel sizes as the plural fractal-based features. The changes to Claim 3 are supported by the originally filed specification and do not add new matter.⁴ In a non-limiting example, Applicants refer the Examiner to Figure 4, which shows the plural surface areas plotted versus the pixel size, and Figure 5, which shows the plural volumes plotted versus the pixel size. Applicants respectfully submit that the '305 patent and the Caldwell et al. reference failed to disclose applying plural fractal-based features in a linear discriminant classifier or an artificial neural classifier, wherein the plural fractal-based features are surface areas or volumes at multiple pixel sizes, as required by Claim 3. Accordingly, Applicants respectfully submit that dependent Claim 3 patentably defines over any proper combination of the cited references.

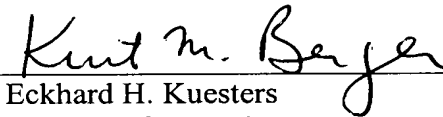
Thus, it is respectfully submitted that independent Claims 1, 11, and 21 (and all associated dependent claims) patentably define over any proper combination of the '305 patent and the Caldwell et al. reference.

⁴ See, e.g., paragraphs [0049] and [0052] of the originally filed specification.

Consequently, in view of the present amendment and in light of the above discussion, the outstanding grounds for rejection are believed to have been overcome. The application as amended herewith is believed to be in condition for formal allowance. An early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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